



Graham Van Goffrier

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PhD Candidate in Particle Theory, University College London

About Me A passionate early-career researcher working at the interface of particle and nuclear physics, with broad experience across neutrino theory, effective field theories, computational Bayesian statistics, and causal inference. Furthermore, a skillful written and spoken communicator, an animated teacher of students at all levels, and a community leader.

Education

2019 - 2024, University College London

PhD Candidate in Particle Theory

- Thesis: *Improved Nuclear Matrix Elements for Neutrinoless Double-Beta Decay ($0\nu\beta\beta$)*
- Supervisors: Professor Frank Deppisch, Professor Keith Hamilton, Dr Matteo Agostini
- Funding: UCL Overseas Research Scholarship; STFC CDT for Data-Intensive Science

2018 - 2019, Homerton College, University of Cambridge

MASt in Applied Mathematics

- Essay: *Confinement* (proposed by Professor David Skinner)

2014 - 2018, University of Maine

M.S. in Electrical Engineering, B.S. in Physics (both GPA 4.00/4.00)

- University Valedictorian
- Thesis: *Visualization of Open and Closed String Worldsheets* (with Professor Neil Comins)
- Minors: Mathematics, Electrical Engineering, Nanotechnology
- Phi Beta Kappa, Tau Beta Pi, Sigma Pi Sigma, Eta Kappa Nu

Research Employment

2022, *Research Intern, Spotify*

- Theoretical causal inference research, focused on construction of instrumental estimators for chains of confounded-mediator variables as relevant to recommender systems.
- Supervisors: Dr. Ciarán Gilligan-Lee and Dr. Lucas Maystre (Tech Research)

2020, *Research Placement, U.K. Atomic Energy Authority*

- Application of machine learning and surrogate models to optimize the design of tritium-breeding fusion reactors.
- Supervisors: Dr. Jonathan Shimwell and Vignesh Gopakumar

2019, *Research Placement, Faculty of Engineering, University of Cambridge*

- Investigated extremal-eigenvalue geometry on the cone of symmetric positive-definite matrices, with application to efficient interpolation between and K-means clustering of large covariance matrices.
- Supervisors: Dr. Cyrus Mostajeran and Professor Rodolphe Sepulchre
- Funding: Cambridge Mathematics Placements (CMP) Programme

2017, *Summer Research Student, ATLAS Experiment, CERN*

- Applied FOAMs (iteratively discretized probability distributions) to Monte Carlo event generation for ttH Higgs production.
- Supervisors: Professor Tancredi Cardi and Dr. Alexander Held
- Funding: NSF UM-CERN-REU, supported by the University of Michigan

2015-2016, *Summer Research Assistant, University of Maine*

- Studied surface-acoustic-wave (SAW) devices in the Laboratory for Surface Science and Technology, fluorescence photoactivation localization microscopy (FPALM) in the Hess Biophysics Lab, and context-based reasoning in MaineSAIL.
- Supervisors: Professor Mauricio da Cunha, Professor Sam Hess, Professor Roy Turner



Publications

- [7] M. Agostini, F. Deppisch, **G. Van Goffrier**, “Probing Neutrinoless Double Beta Decay in Multiple Isotopes,” in preparation for JHEP (2022)
- [6] C. Gilligan-Lee, L. Maystre, **G. Van Goffrier**, “Estimating long-term causal effects from short-term experiments in the presence of unobserved confounding,” in preparation for CLeaR (2022)
- [5] J. G. Lee, C. Mostajeran and **G. Van Goffrier**, “Node-wise monotone barrier coupling law for central pattern generation,” Submitted to Automatica (2022), arXiv:2202.02759 [eess-SY]
- [4] P. Mánek, **G. Van Goffrier**, V. Gopakumar, N. Nikolaou, J. Shimwell and I. Waldmann, “Fast Regression of the Tritium Breeding Ratio in Fusion Reactors,” Submitted to Mach. Learn.: Sci. Technol. (2022), arXiv:2104.04026v2 [physics.comp-ph]
- [3] C. Mostajeran, J. G. Lee, **G. Van Goffrier** and R. Sepulchre, “Target formation on the circle by monotone system design,” 2021 60th IEEE Conference on Decision and Control, pp. 7106-7111 (2021) doi:10.1109/CDC45484.2021.9683688, arXiv:2103.13913v2 [math.OC]
- [2] F. Deppisch and **G. Van Goffrier**, “Least-informative priors for $0\nu\beta\beta$ decay searches,” Phys. Rev. D, 104(5), 055040 (2021) doi:10.1103/PhysRevD.104.055040, arXiv:2103.06660v2 [hep-ph]
- [1] **G. Van Goffrier**, C. Mostajeran, R. Sepulchre, “Inductive Geometric Matrix Midranges,” FAC-PapersOnLine 54.9, pp. 584-589 (2021) doi:10.1016/j.ifacol.2021.06.120, arXiv:2006.01508v3 [cs.LG]

Awards

[2019, Overseas Research Scholarship, University College London](#)

Full funding for four-year duration of PhD research, including maintenance stipend.

[2019, NSF Graduate Research Fellow](#)

Declined due to acceptance of PhD position outside the U.S.

[2018, Valedictorian, University of Maine](#)

[2017, Goldwater Scholar](#)

[2015-16, Putnam Mathematical Competition, University of Maine High-Scorer](#)

[2014, National Merit Scholar](#)

Teaching Employment

[2019-22, PGTA, University College London](#)

- Assisted laboratory sections in Mathematica for Physics, Mathematical Methods III
- Ran problem classes and marked sets for Particle Physics

[2019, Invigilator, Homerton College, University of Cambridge](#)

[2015-18, Teaching Assistant, University of Maine](#)

- Assisted laboratory sections in Circuit Design, Electronics, etc.
- Ran laboratory sections for Intro to Electricity and Magnetism
- Hosted CV workshops and mock interviews for engineering students



Invited Talks and Conference Presentations

- Nov 2022 *The Future of Nuclear Matrix Elements for $0\nu\beta\beta$*
Invited Talk, HEP Phenomenology Seminar, University of Cambridge
- Sep 2022 *Estimating Treatment Effects with Confounded Mediators* (Spotify internship)
Data-Intensive Science Annual Meeting, University College London
- May 2022 *Probing $0\nu\beta\beta$ in Multiple Isotopes*
Parallel Talk, 7th Symposium on Neutrinos and Dark Matter in Nuclear Physics
University of North Carolina, Asheville, NC, USA
- May 2022 *Theoretical Frontiers in Neutrinoless Double-Beta Decay ($0\nu\beta\beta$)*
Invited Talk, University of Maine, Orono, ME, USA
- May 2022 *Probing $0\nu\beta\beta$ in Multiple Isotopes*
Parallel Talk, 7th Phenomenology 2022 Symposium: From Virtual to Real
University of Pittsburgh, Pittsburgh, PA, USA
- Dec 2021 *Theoretical Frontiers in Neutrinoless Double-Beta Decay ($0\nu\beta\beta$)*
Full-Length Talk, Young Theorists' Forum 2021
Durham University, Durham, UK
- Dec 2021 *Mechanisms of Neutrinoless Double-Beta Decay*
Talk, SEPTA Consortium Meeting at University of Sussex, Brighton, UK
- Aug 2021 *Subtleties of Majorana Neutrinos*
Project Talk, International Neutrino Summer School, CERN, Geneva, CH
- Jul 2021 *Bayesian Methods for $0\nu\beta\beta$ Decay*
Short Talk, XI NExT PhD Workshop: Probing fundamental physics at colliders and beyond
University of Sussex, Brighton, UK
- Mar 2021 *Chiral Perturbation Theory for $0\nu\beta\beta$ Decay*
Mini-Workshop on Chiral Perturbation Theory, University College London
- Feb 2021 *Least-Informative Priors for Neutrinoless Double-Beta Decay*
Student Talk, 50th British Universities Summer School in Theoretical Elementary Particle Physics
Queen Mary University of London, London, UK
- Nov 2020 *Least-Informative Priors for Neutrinoless Double-Beta Decay*
Student Talk, UK HEP Forum 2020: Quantum leaps to the dark side
Durham University, Durham, UK
- Jul 2020 *Full Discretization of Local Gauge Invariance*
Project Talk, Wolfram Summer School, Boston, MA, USA
- Mar 2019 *Confinement*
Part III Seminar Series, DAMTP, University of Cambridge, Cambridge, UK
- Nov 2018 *Kac-Moody Algebras*
Part III Seminar Series, DAMTP, University of Cambridge, Cambridge, UK
- Aug 2017 *Using FOAMs to Approximate Probability Densities for $t\bar{t}$ Processes*
Summer Student Lecture Programme General, CERN, Geneva, CH
- May 2017 *"Investigation and Visualization of the Correlation between Minimal Surfaces and Minimal Lengths"*
Poster, Center for Undergraduate Research Symposium
University of Maine, Orono, ME, USA

Software Development Expertise

- C++
- Python
- Mathematica
- MATLAB
- Machine Learning
- Monte Carlo Simulation